APPENDIX B

Forest Plan Management Requirements for Hydrology: BMPs and WCPs

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Management requirements will include the following Watershed Conservation Practices (WCP) (Forest Service Handbook 2509.25, USDA-Forest Service R-2, 2001), Best Management Practices (BMPs) (South Dakota-Division of Forestry, 1994), and Forest Plan Standards and Guidelines (Standard) (USDA-Forest Service, Black Hills National Forest, 1997).

Hydrologic Function

Standard 1112, WCP 2: Manage land treatments to maintain enough organic ground cover in each land unit to prevent harmful increased runoff. Design Criteria:

(a) Maintain the organic ground cover of each land unit so that pedestals, rills and surface runoff from the land unit are not increased.

Standard 1116, WCP 1: Manage land treatments to conserve site moisture and to protect long-term stream health from damage by increased runoff. Design Criteria:

BMP: Designate streamside management zones (SMZ) to provide stream shading, sediment and water filtering effects, and wildlife habitat... The width of the SMZ should extend beyond the 50' minimum to include wetlands along a stream bottom and to provide additional protection in areas of steep slopes or erosive soils.

BMP: Maintain or provide sufficient ground cover to trap sediment.

Standard 1209: Manage vegetation treatments so that stream flows are not changed to the extent that long-term stream health is degraded.

Riparian Areas

Guideline 1115: When ground disturbing or vegetation management occur, use vegetative buffer strips or barriers to reduce sediment. Determine buffer width between stream and roads or trails using the equation in Appendix J. (Treated as a Standard.)

Standard 1203, WCP 4: Design and construct all stream crossings and other instream structures to provide for passage of flow sediment, withstand expected flood flows, and allow free movement of resident aquatic life. Design Criteria:

(a) Install stream crossings to meet Corps of Engineers and State permits, pass normal flows and be hardened to withstand floods as follows: Design life of one year - Design flood is 10 year recurrence interval; up to Design life of 50 years - Design flood is 200 recurrence interval.

(b) Size culverts and bridges to pass debris. Engineers work with hydrologists and aquatic biologists on site design.

(c) Install stream crossings on straight and resilient stream reaches, as perpendicular to flow as feasible, and to provide passage of fish and other aquatic life.

(d) Install stream crossings to sustain bankfull dimensions of width, depth, and slope and keep streambeds and banks resilient. Favor hardened fords and bridges on streams with floodplains, and bottomless arches instead of pipe culverts.

Standard 1301, WCP 3: In the water influence zone (WIZ) next to perennial and intermittent streams, lakes, and wetlands, allow only those actions that maintain or improve long-term stream health and riparian ecosystem condition. Design Criteria:

(c) Keep heavy equipment out of streams, swales, and lakes, except to cross at designated points, build crossings, or do restoration work, or if protected by at least one foot of packed snow or two inches of frozen soil. Keep heavy equipment out of streams during fish spawning, incubation, and emergence periods.

(d) Ensure at least one-end log suspension in the WIZ. Fell trees in a way that protects vegetation in the WIZ from damage. Keep log landings and skid trails out of the WIZ including swales.

(e) Locate new concentrated-use sites outside the WIZ if feasible, and outside of riparian areas and wetlands always. Harden or reclaim existing sites in the WIZ to prevent detrimental soil and bank erosion.

BMP: Consider road surfacing to minimize erosion.

Standard 1304: As opportunity arises, and need dictates, relocate or implement mitigation measures for roads, trails, watering tanks, ponds, water catchments, and similar facilities currently located within the Water Influence Zone.

Standard 1305: Locate camping sites for contractual purposes (e.g., mining, logging, etc.) such that channel and riparian areas are not impacted.

Sediment Control

Standard 1105, WCP 9: Limit roads and other disturbed sites to the minimum feasible number, width, and total length consistent with the purpose of specific operations, local topography, and climate. Design Criteria:

(b) Avoid soil-disturbing actions during periods of heavy rain or wet soils. Apply travel restrictions to protect soil and water.

(c) Install cross drains to disperse runoff into filter strips and minimize connected disturbed areas (CDA). Make cuts, fills, and surfaces strongly resistant to erosion between each stream crossings and at least the nearest cross drain. Revegetate using certified local native plants as feasible; avoid persistent or invasive exotic plants.

(e) Retain stabilizing vegetation on unstable soils. Avoid new roads or heavy equipment use on unstable or highly erodible soils.

(f) Use existing roads unless other options will produce less long-term sediment. Reconstruct for long-term soil and drainage stability.

(g) Avoid ground skidding with blades lowered or on highly erodible slopes steeper than 40%. Conduct logging to disperse runoff as feasible.

BMP: Design and locate skid trails and skidding operations to minimize soil disturbance. Using designated skid trails is one means of limiting soil disturbance.

BMP: Minimize the number of roads constructed in a watershed through comprehensive road planning, recognizing intermingled ownership and foreseeable future uses. Use existing roads where practical, unless such roads would cause or aggravate an erosion problem.

Standard 1106, WCP 11: Stabilize and maintain roads and other disturbed sites during and after construction to control erosion. Design Criteria:

(c) Do not disturb ditches during maintenance unless needed to restore drainage capacity or repair damage. Do not undercut the cut slope.
(d) Space cross drains, from no more than 120 feet in highly erodible soils on steep grades, to no more than 1000 feet in resistant soils on float grades. Do not divert water from one stream to another.
(e) Empty cross drains onto stable slopes that disperse runoff into filter strips. On soils that may gully, armor outlets to disperse runoff. Tighten cross-drain spacing so gullies are not created.
(f) Harden rolling dips as needed to prevent rutting damage to the function of the rolling dips. Ensure that road maintenance provides stable surfaces and drainage.
(h) Build fire lines with rolling grades and minimum downhill convergence. Outslope or backblade, permanently drain, and revegetate fire lines immediately after the burn. Use certified local native plants as feasible; avoid persistent or invasive exotic plants.

Standard 1109, WCP 12: Reclaim roads and other disturbed sites when use ends, as needed, to prevent resource damage. Design Standard:

(a) Site-prepare, drain, revegetate, and close temporary and intermittent use roads and other disturbed sites within one year after use ends. Provide stable drainage that disperses runoff into filter strips and maintains stable fills. Do this work concurrently. Use certified local native plants as feasible; avoid persistent or invasive exotic plants.

Guideline 1110: Initiate revegetation as soon as possible, not to exceed 6 months, after termination of ground-disturbing activities. Revegetate all disturbed soils with native species when available in seed/plant mixtures that are noxious weed-free. On areas needing the immediate establishment of vegetation, non-native non-aggressive annuals, non-aggressive perennials (such as alfalfa), or sterile perennial species may be used while native perennials are becoming established. This is used to prevent the spread of noxious weeds and prevent erosion. If mulches are used they are to be noxious weed free. (Treated as a Standard.)

Guideline 1111: Stabilize, scarify or recontour temporary roads, constructed skid trails and landings prior to seeding. (Treated as a Standard.)

Standard 1113, WCP 10: Construct roads and other disturbed sites to minimize sediment discharge into streams, lakes and wetlands. Design Criteria:

(a) Design all roads, trails, and other soil disturbances to the minimum standard for their use and to "roll" with the terrain as feasible.

(b) Use filter strips, and sediment traps if needed, to keep all sand-sized sediment on the land and disconnect disturbed soil from streams, lakes and wetlands. Disperse runoff into filter strips.
(d) Keep heavy equipment out of filter strips except to do restoration work or build hardened stream or lake approaches. Yard logs up out of each filter strip with minimum disturbance of ground cover.
(e) Build fire lines outside filter strips unless tied into a stream, lake, or wetland as a firebreak with minimal disturbed soil. Retain organic ground cover in filter strips during prescribed fires.
(f) Design road ditches and cross drains to limit flow to ditch capacity and prevent ditch erosion and failure.

BMP: Prevent downslope movement of sediment by using sediment catch basins, drop inlets, changes in road grade, headwalls, or recessed cut slopes.
BMP: Route road drainage through the Streamside Management Zone (SMZ), filtration fields, or other sediment settling structures. Install road drainage features above stream crossings to route discharge into filtration zones before entering a stream.
BMP: Locate skid trails to avoid concentrating runoff and provide breaks in grade. Locate skid trails and landings away from natural drainage systems and divert runoff to stable areas. Use mitigating measures, such as water bars and grass seeding to reduce erosion on skid trails.
BMP: Avoid locating landings that require skidding across drainage bottoms.

Standard 1114: When construction of maintenance level 1 roads, temporary roads, skid trails and landings occur, install structures to divert runoff when needed.

Soil Productivity

Standard 1102, WCP 14: Maintain or improve long-term levels of organic matter and nutrients on all lands. Design Criteria:

(a) On soils with topsoil thinner than 1 inch, topsoil organic matter less than 2%, or effective rooting depth less than 15 inches, retain 90% or more of the fine (less than 3 inches in diameter) logging slash in the stand after each clear-cut and seed-tree harvest, and retain 50% or more of such slash in the stand after each shelterwood and group-selection harvest, considering existing and projected levels of fine slash.
(c) For areas adjacent to roads and trails, retain slash described in (a) at levels that meet Guideline 4112: Treat activity fuel adjacent to roads and trails as follows:
    a. For Forest Development Roads classified as collectors, and Forest Development Trails, manage activity fuels to meet adopted SIO (Scenic Integrity Objective).
    b. For federal, state, county and Forest Development Roads classified as arterials, remove 70 to 90 percent of the activity fuels seen from the road's edge up to a maximum distance of 300 feet. Treat debris within 1 year of harvest completion.

Standard 1103, WCP 13: Manage land treatments to limit the sum of severely burned and detrimentally compacted, eroded, and displaced land to no more than 15% of any land unit (FSH 2509.18). Design Criteria:

(a) Restrict roads, landings, skid trails, concentrated-use sites, and similar soil disturbances to designated sites.
(b) Operate heavy equipment for land treatments only when soil moisture is below the plastic limit, or protected by at least 1 foot of packed snow or 2 inches of frozen soil.
(c) Conduct prescribed fires when soil, humus, and large fuels are moist.

BMP: Tractor skid when compaction, displacement, and erosion will be minimized. Avoid tractor or wheeled skidding on unstable, permanently or seasonally wet, or easily compacted soils, and on slopes that exceed 40% unless operation can be conducted without causing excessive erosion. Avoid skidding on highly erodible soils, or with blade lowered.

Guideline 1104: Minimize soil compaction by reducing off-road vehicle passes, by skidding on snow, frozen or dry soil conditions, or by off-ground logging systems. (Treated as a Standard.)

Water Purity

Standard 1211, WCP 15: Place new sources of chemical and pathogenic pollutants where such pollutants will not reach surface or ground water. Design Criteria:

(b) Put vehicle service and fuel areas, chemical storage and use areas, and waste dumps and areas on gentle upland sites. Mixing, load, and clean on gentle upland sites. Dispose of chemicals and containers in State-certified disposal areas.